

Water Treatment Plant Rehabilitation Preliminary Design

City Project No. 2023-03

*Brian Connolly, Public Works Director
Ryan Capelle, Stantec
Brian Lintgen, Stantec
August 14, 2023*



PUBLIC WORKS DEPARTMENT

www.ighmn.gov

Project Overview

- Elevated Radium Levels in IGH Drinking Water
- Water Treatment Plant Upgrades Budgeted for 2024
 - \$4,700,000 Draft CIP Estimate - Construction
- Awarded Preliminary/Final Design Contract to Stantec on April 24, 2023
- Completed pilot testing of two different filter media combinations
- Completed Preliminary Design Report
 - Recommended "Phase 1" improvements – Focus on water treatment items (filter, chemicals, piping, etc.)
 - Cost estimates
 - Future work recommendations

Current Schedule

Action Item	Original Date (4/24/2023)	Modified Date (7/24/23)
Award Contract	April 24, 2023	April 24, 2023
Preliminary Design Report (Draft) Complete	June 30, 2023	July 10, 2023
Preliminary Design - Progress Update*		July 24, 2023
Preliminary Design Report - Presentation and Recommended Adoption by City Council *	July 24, 2023	August 14, 2023
MDH/PFA DWRF Loan Program Notice		Sept./Oct. 2023
Final Design Complete (Phase 1)	September 1, 2023	December 31, 2023
MDH Certification (Design/Funding Approval)		January - March 2024
Bidding & Contract Award (Phase 1)	Sept/Oct 2023	Spring, 2024
Construction (Phase 1)	Nov. 2023 - Mar. 2024	Late-Summer/ Fall 2024

Items Impacting Schedule

- Delay in Pilot Testing and Pilot Testing Lab Results
- Slow material supplier response for costs and lead time
- Scope of rehabilitation has increased due to filter media and existing system considerations
 - Dual vs. Single Filter Media
 - Replace backwash system vs. retain existing system
- Material Lead Time
 - Several key components have 20+ week order lead times
- Construction needs to occur “off-peak”
 - September through May
- Drinking Water Revolving Fund (DWRF) Loan Approval Requirements
 - Pending City Qualification (October 2023)
 - Iterative Process – Review, Comment, and Response Period

Key Noted Deficiencies – Phase 1

Filter Media, Wash Troughs, and Underdrain Nozzles

Filter Media

- Existing media has reached the end of its useful life.
- Install new media that is better for radium removal.
- Pilot testing two media types, both Dual Media w/anthracite coal. Will bid both types as alternates. More competition and better prices for the City.

Wash Troughs

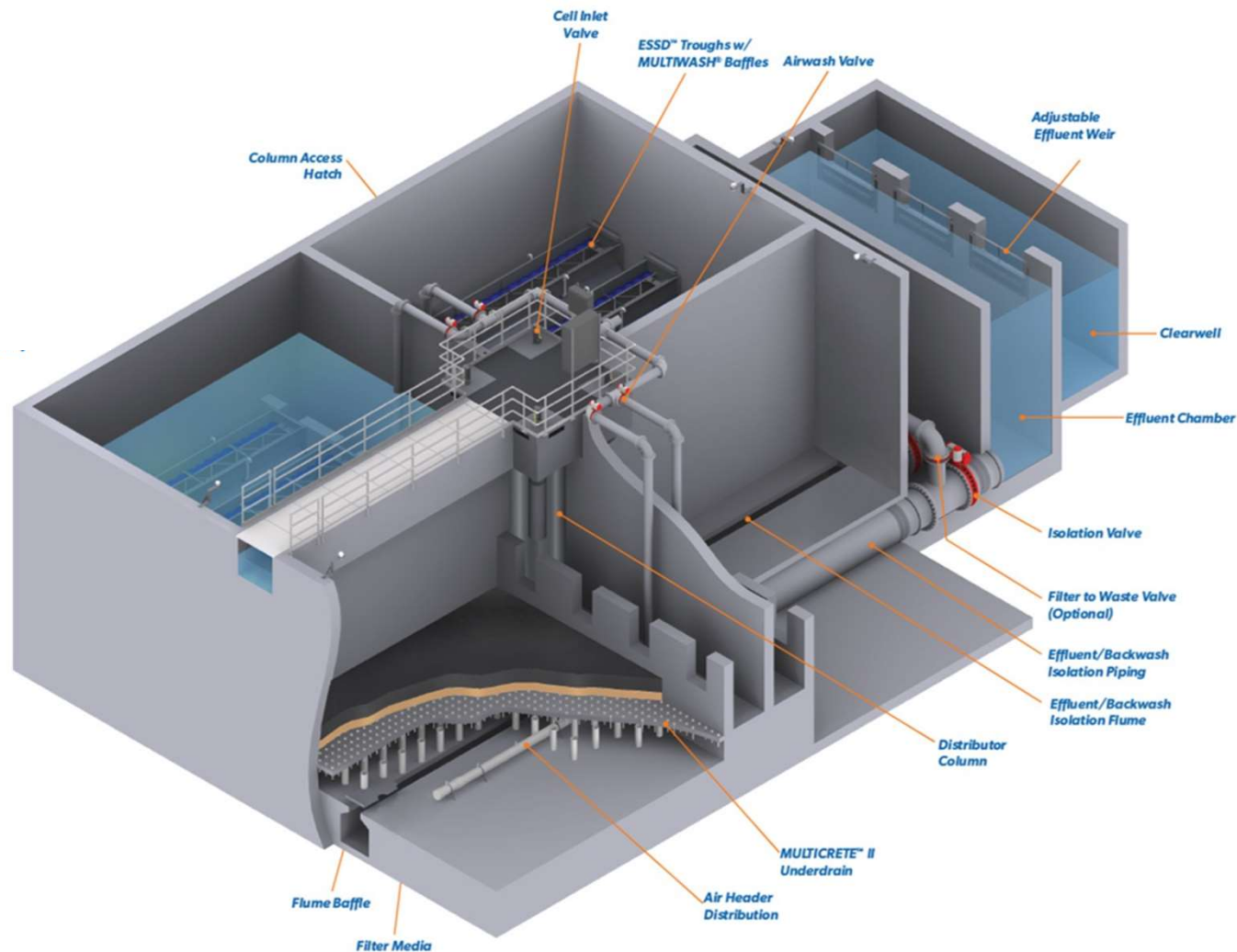
- New, media retaining wash troughs need to be installed to retain the dual media.

Underdrain Nozzles

- New underdrain nozzles. Media must be removed to replace. Best practice to replace during a media replacement.

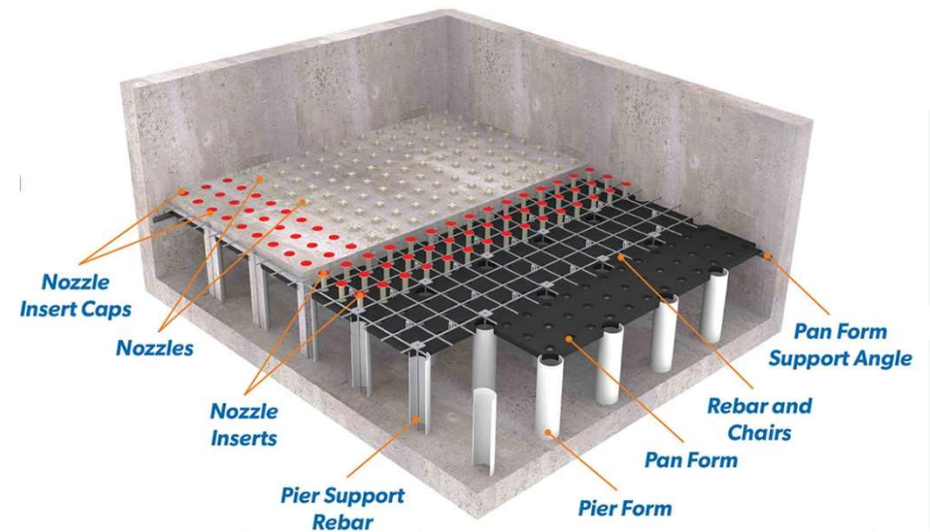
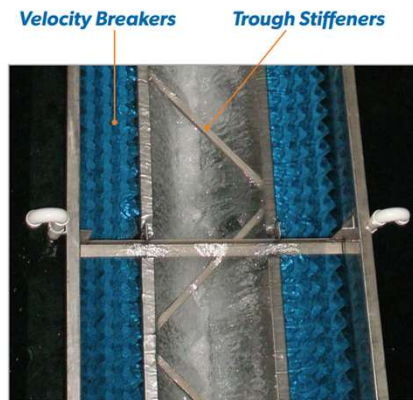
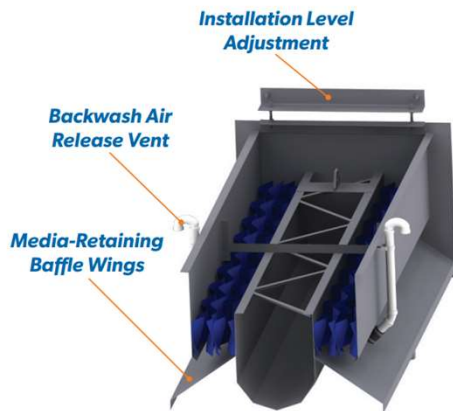
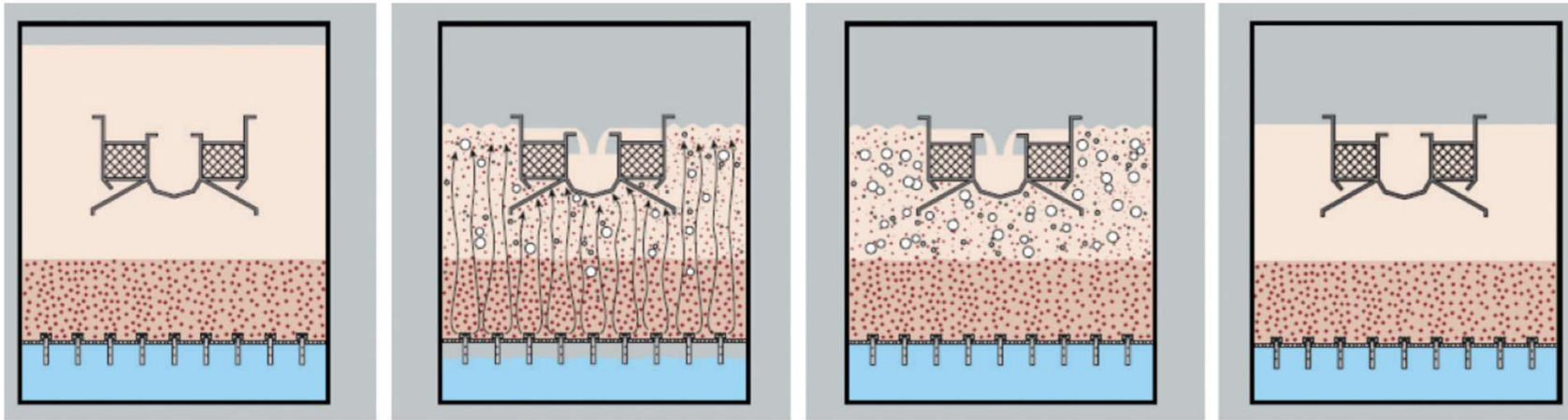
Key Noted Deficiencies – Phase 1

Filter Media, Wash Troughs, and Underdrain Nozzles



Key Noted Deficiencies - Phase 1

Filter Media, Wash Troughs, and Underdrain Nozzles



Key Noted Deficiencies – Phase 1

Filter 1-4 Distribution Box Replacement

Purpose

- Provides even distribution of raw water to each of the four filter cells.

Existing Conditions

- Filter 1-4 (original plant) constructed of carbon steel.
- Maintenance intensive to keep protected.

Rehabilitation

- Construct distribution box from stainless steel.
- No coating needed, improved longevity.
- Will match Filter 5-8 (2006 expansion).

Key Noted Deficiencies - Phase 1

Filter 1-4 Distribution Box Replacement



Carbon Steel, Filter 1-4

Stainless Steel, Filter 5-8



Key Noted Deficiencies – Phase 1

Replace Filter Valves and add Electric Actuation

Valves

- Filter valves receive heavy use each backwash.
- Replacement to ensure continued reliable operation.
- Replace inlet, air wash, and backwash waste valves.

Actuators

- Current pneumatic valve actuators.
 - More maintenance and less reliability.
- Replace with electric actuators.
 - Higher initial cost but can eliminate the air compressor.
 - Increased reliability and redundancy.

Key Noted Deficiencies – Phase 1

Replace Filter Valves and add Electric Actuation



Key Noted Deficiencies – Phase 1

Chemical Feed Systems

Fe/ Mn/Radium Treatment Chemicals

- Existing potassium permanganate and manganese sulfate. Two separate chemical systems.
- Replace with a preformed hydrous manganese oxide (HMO). Use TonkaZorb by Kurita (premixed chemical).
- Repurpose the manganese sulfate room for TonkaZorb.

Fluoride

- New peristaltic dosing pumps.

Chlorine

- New rotameters, vacuum switchovers, and detectors.
- Move eductors (device that combines gas and water) into chlorinator room to reduce piping conveying chlorine gas, versus chlorine in solution with water.

Key Noted Deficiencies - Phase 1

Chemical Feed Systems



Key Noted Deficiencies – Phase 1

Flow Meters

Background

- Existing propeller type flow meters are failing.
- Newer technology is more accurate and requires less maintenance.
- Bid as an add alternate to Phase 1 Improvements.

Large Pipes

- 24" finished water (ground storage) has already been replaced with an ultrasonic meter. Working well.
- Replace 30" raw water and 24" Asher finished water with ultrasonic meters.

Small Pipes

- Replace all propeller meters with new magnetic meters.

Key Noted Deficiencies - Phase 1

Flow Meters



Cost Estimate – Phase 1 Improvements

Summary

Improvements in the RFP

\$3,595,000

Additional Suggested Imp.

\$261,000

Contingency (35%)

\$1,350,000

Total

\$5,206,000

	Estimated Cost	Item Used	Cumulative Total
<u>PHASE 1 IMPROVEMENTS FROM RFP</u>			
<u>REPLACE SAND FILTER MEDIA</u>			
1a-1 Tonka IMAR media.	\$330,000	X	\$330,000
1a-2 GreensandPlus and anthracite media.	\$420,000		\$330,000
1b Labor to remove and install media.	\$700,000	X	\$1,030,000
1c-1 Install new WesTech wash troughs with media retention. Revise trough elevation. 3 per cell.	\$770,000	X	\$1,800,000
1c-2 Install new Kurita wash troughs with media retention. Revise trough elevation. 2 per cell.	\$890,000		\$1,800,000
1d Add weir wall plates and rehab existing plates.	\$50,000	X	\$1,850,000
<u>REVIEW AND UPGRADE DRAIN PIPING ON THE FILTERS</u>			
2a Replace underdrain nozzles.	\$160,000	X	\$2,010,000
2b Inspect underdrain and air piping. Repairs as necessary.	\$5,000	X	\$2,015,000
<u>REVIEW CONDITION OF PAINT IN FILTER 1-4 DISTRIBUTION BOX</u>			
3a Filter 1-4 distributor box replacement with stainless steel.	\$535,000	X	\$2,550,000
3b Weld inspection of center columns.	\$10,000	X	\$2,560,000
<u>REPLACE ALL FILTER VALVES AND AIR COMPRESSOR VALVES</u>			
4a-1 Filter valve actuation - <u>pneumatic actuator replacement</u>	\$270,000		\$2,560,000
4a-2 Filter valve actuation - <u>electric actuator conversion</u>	\$385,000	X	\$2,945,000
Valve replacement: airwash supply (8"), influent on distributor box (12"), & backwash waste in			
4b column (18") on each cell	\$250,000	X	\$3,195,000
4c Repaint all pipe and valves in the filters.	\$100,000	X	\$3,295,000
<u>CONSIDER NEW CHEMICAL FEED HMO</u>			
New TonkaZorb HMO chemical feed equipment. Rehab manganese sulfate room for TonkaZorb,			
5 mothball non-used equipment.	\$120,000	X	\$3,415,000
<u>REPLACE FLUORIDE PUMPS</u>			
6 New peristaltic dosing pumps. Repair electrical panel.	\$30,000	X	\$3,445,000
<u>REPLACE CHLORINE FEED SYSTEMS</u>			
7a New rotameters and vacuum switchovers. Move eductors.	\$70,000	X	\$3,515,000
7b Chlorinator room plumbing modifications.	\$30,000	X	\$3,545,000
7c New chlorine alarms and automatic ventilation.	\$50,000	X	\$3,595,000
<u>ADDITIONAL SUGGESTED PHASE 1 IMPROVEMENTS</u>			
8 Blower: Inspection of components. Address immediate needs.	\$50,000	X	\$3,645,000
9 Electrical Infrared Testing: One day of third party testing and report.	\$3,000	X	\$3,648,000
10 Smoke Dampers: Test and troubleshoot stuck dampers.	\$3,000	X	\$3,651,000
11 Portable Dehumidifiers: Purchase 4 additional.	\$20,000	X	\$3,671,000
12 Exterior Clearwell Cover Cracking: Repair clearwell lid and replace failing retaining wall.	\$50,000	X	\$3,721,000
13 Flow splitter room: Removal of tank coating.	\$10,000	X	\$3,731,000
<u>FLOW METERS</u>			
Replace large flow meters with clamp on ultrasonic meters. Spool pipe in old propeller meter			
14a location.	\$60,000	X	\$3,791,000
14b-1 Replace small flow meters with custom length mag meters.	\$65,000	X	\$3,856,000
14b-2 Replace small flow meters with standard length mag meters and spool pipe.	\$100,200		\$3,856,000
<u>TOTAL PHASE 1 IMPROVEMENTS</u>			
	\$3,856,000		
Contingency (35%)	\$1,350,000		
Total with Contingency	\$5,206,000		

Phase 1 – Design & Construction Schedule

August 2023: Report approval

September 2023: Begin Phase 1 design

Sept./Oct. 2023: MDH/PFA DWRF Loan Program Notice

December 2023: Phase 1 design complete, MDH review

Spring 2024: Bidding and contract award

Summer 2024: Contractor material procurement

September 2024: Begin Phase 1 construction

April 2025: Phase 1 construction complete

Contaminants of Emerging Concern

Per- and polyfluoroalkyl substances (PFAS)

- The key contaminant of emerging concern the City is watching is PFAS.
- **The City's drinking water is in compliance with current drinking water standards.**
- City Staff and Stantec design professionals are actively following the status of proposed rulemaking changes.
- Substantial modifications would be required to supplement the current treatment process to include treatment for PFAS.
- The specific feasibility of PFAS treatment for the City is not part of the scope of this report but can be studied at a future date if it becomes necessary.

Key Noted Deficiencies – Future Phases

Roof Replacement and Rooftop Heating and Cooling Units

Roof

- Leaks and overall deficiencies. At the end of useful life.

Rooftop HVAC units

- Multiple units. Maintenance issues on all. Have reached end of useful life.

Coordinated Schedules

- Recommend roof and HVAC units at the same time.
- To replace the roof, HVAC units need to be removed no matter if they are being replaced or not.
- Efficiencies in crane rental and reattachment costs.

Key Noted Deficiencies – Future Phases

Review Condition of Paint

- City Staff has done a good job of keeping up on painting, however a refresh is needed.
- Tank seals need to be replaced to prevent water damage to paint.
- Continued longevity of components.



Install New Variable Frequency Drives (VFDs) for all High Service Pumps

- Replace three existing VFDs near the end of useful life.
- Add VFDs for remaining high service pumps and backwash pump.
- Provides greater operational flexibility and less motor wear.



Key Noted Deficiencies – Future Phases

Improvements in Progress or Programed in Facility Maintenance Budgets

Centralized Dehumidifier

- Critical for plant operation, prevents moisture damage.
- Device reliability is decreasing.
- Cost to maintain is increasing.
- Parts are hard to find.
- Replace with a new central dehumidification unit.



Upgrade Interior and Exterior Lights to LED

- Increased longevity and reduced operating costs.

Cost Estimate – Future Phase Improvements

Summary

Improvements in the RFP

\$933,000

Additional Suggested Imp.

\$105,000

Contingency (35%)

\$364,000

Total

\$1,402,000

FUTURE PHASE IMPROVEMENTS FROM RFP

MISCELLANEOUS ITEMS

101 Review condition of paint for all filter room walls and piping	\$100,000	X	\$100,000
102 Upgrade security cameras	\$25,000	X	\$125,000
103 Replace air compressor and air dryer	\$80,000		\$125,000
104 Install new VFDs on high service pumps	\$200,000	X	\$325,000
105 Radon gas mitigation system for filter bays	\$20,000	X	\$345,000

ROOF ITEMS

106a Roof rehabilitation/replacement	\$425,000	X	\$770,000
106b Replace rooftop heating and cooling units	\$75,000	X	\$845,000
106c Upgrade main SCADA antenna	\$3,000	X	\$848,000
106d Replace make-up air unit	\$60,000	X	\$908,000
106e Replace exhaust unit	\$25,000	X	\$933,000

ADDITIONAL SUGGESTED FUTURE PHASE IMPROVEMENTS

107 Repair exterior railings	\$25,000	X	\$958,000
108 Backfill retaining walls	\$10,000	X	\$968,000
109 Replace filter level transducers with radar	\$30,000	X	\$998,000
110 Miscellaneous plumbing and HVAC items	\$25,000	X	\$1,023,000
111 Add wireless access points	\$10,000	X	\$1,033,000
112 Repair/replace generator emissions monitoring panel	\$5,000	X	\$1,038,000

TOTAL FUTURE PHASE IMPROVEMENTS

Contingency (35%)	\$1,038,000		
Total with Contingency	\$364,000		
	\$1,402,000		

IMPROVEMENTS IN PROGRESS OR PROGRAMED IN FACILITY MAINTENANCE BUDGETS

201 Replace dehumidifier	\$300,000	X	\$300,000
202 Update fire alarm panel	\$8,000	X	\$308,000
203 Replace all exterior and interior lights with LED	\$120,000	X	\$428,000

TOTAL IMPROVEMENTS IN PROGRESS OR PROGRAMED

\$428,000

Improvements in Progress or Programed in Facility Maintenance Budgets: \$428,000

Timing of Future Phase Improvements to be determined based on available funding sources and facility need.

DWRF Loan Considerations

Applied for DWRF Loan in March 2023

- Estimated \$4,900,000 for application (includes construction and engineering costs)

If qualified, MDH/PFA Provides DWRF Loan based on bid value

- At current estimate of \$5,206,000, roughly 5% over DWRF application estimate

Recommended Council Action

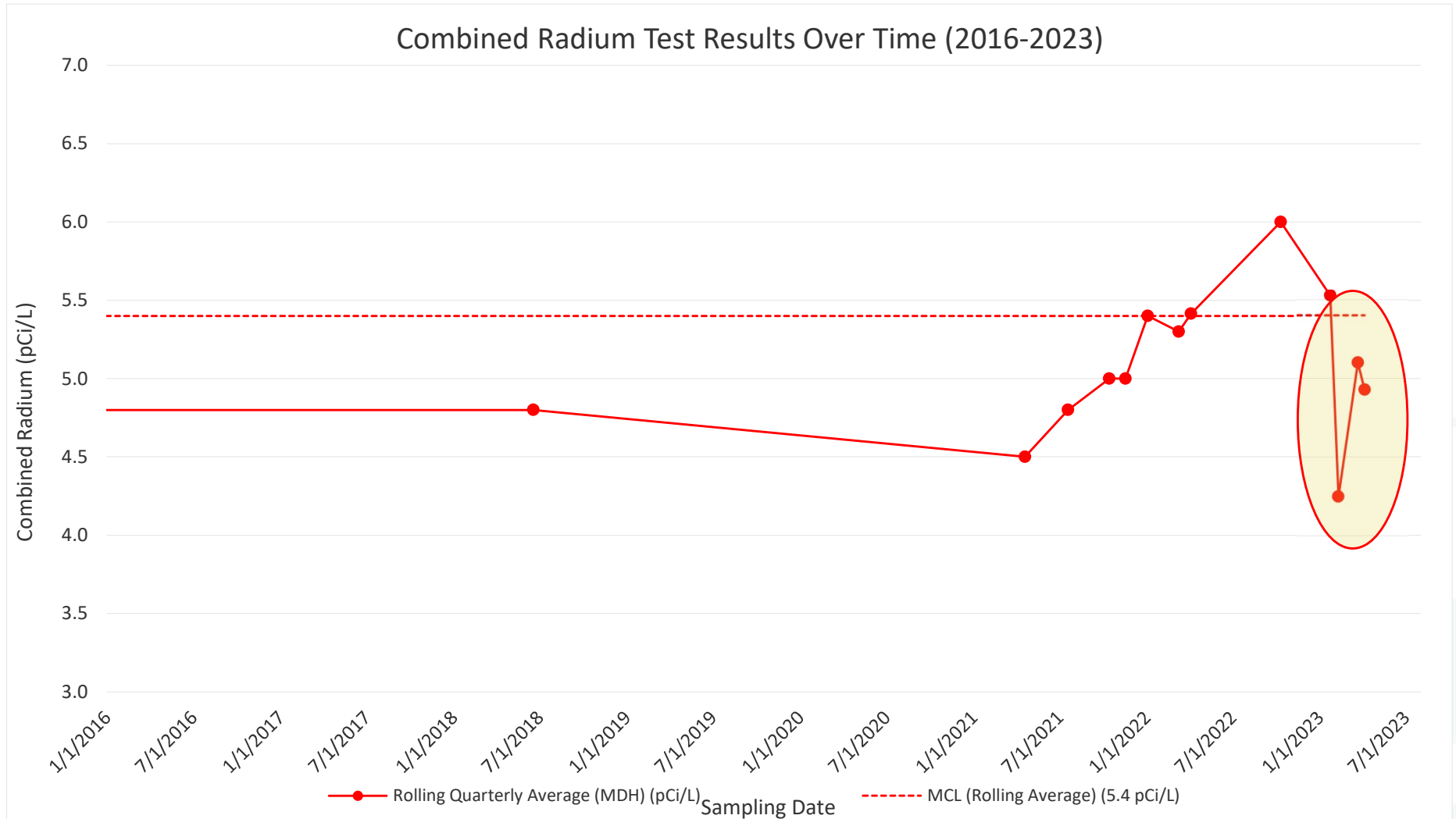
Staff recommends approval of Resolution:

- Accepting the Preliminary Design Report
- Authorizing of preparation of final plans and specifications for the Water Treatment Plant Rehabilitation Improvements (Project No. 2023-03)

Questions/Comments

The Silver Lining

- Chemical treatment modifications made since January 2023 have shown improved effectiveness for Radium removal



Inspection Photos



Distributor Box – Filter Cells 1-4
Painted Steel
Replace with Stainless Steel



Distributor Box – Filter Cells 5-8
Stainless Steel

Inspection Photos



Raw Water Pipe
Remove Insulation
Address Corrosion

Flow Splitter
Remove Paint
Seal Concrete Walls





CITY ADMINISTRATION

8150 Barbara Avenue
Inver Grove Heights, MN 55077
651-450-2500

COMMUNITY DEVELOPMENT

8150 Barbara Avenue
Inver Grove Heights, MN 55077
651-450-2545

FINANCE DEPARTMENT

8150 Barbara Avenue
Inver Grove Heights, MN 55077
651-450-2519

FIRE DEPARTMENT

9200 Courthouse Boulevard
Inver Grove Heights, MN 55077
651-455-5082

PARKS & RECREATION

8055 Barbara Avenue
Inver Grove Heights, MN 55077
651-450-2585

POLICE DEPARTMENT

8150 Barbara Avenue
Inver Grove Heights, MN 55077
651-450-2525

PUBLIC WORKS DEPARTMENT

8168 Barbara Avenue
Inver Grove Heights, MN 55077
ENGINEERING: 651-450-2570
STREETS & UTILITIES: 651-450-4309

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